

IN THE SPECIFICATION

Please amend the specification paragraph starting on page 7 line 16 as follows:

16 (f) using an oscillometric signal to calibrate tonometric pressure signals in a contralateral
17 arterial site.

18

19 In some embodiments, a calibrated radial pressure waveform $P_r(t)$ is derived from the
20 tonometric signal $S_r(t)$ as follows:

21

22 $P_r(t) = (1/a_r)(S_r(t) - b_r) + p$

23

24 where $a_r = (S_r(t_D) - S_r(t_M)) / (DBP - MBP)$,

25 $b_r = S_r(t_M) - a_r MBP$, and

26 $p = \rho gh$ are calibration factors, and where

27 ρ = density of blood,

28 g = acceleration to gravity,

29 h = height difference between the oscillometric and the tonometric measurement
30 sites, and is zero if the patient is supine,

31 MBP is oscillometric mean arterial blood pressure measured at time t_M , and

32 DBP is oscillometric diastolic blood pressure measured at time t_D .

Please amend the specification paragraph starting on page 11 line 2 as follows:

2 In some embodiments, two pressure points are needed for calibration. In one
3 such embodiment, MBP (mean arterial blood pressure) and DBP (diastolic blood
4 pressure) are chosen, and respective corresponding times t_M and t_D (shifted to the
5 appropriate time within a cardiac cycle, e.g., t_D is shifted to the nearest pulse minimum)
6 are used:

7 $S_r(t_M) = a_r \text{ MBP} + b_r$

8 $S_r(t_D) = a_r \text{ DBP} + b_r$

9 $a_r = (S_r(t_D) - S_r(t_M)) / (\text{DBP} - \text{MBP})$

10 $b_r = S_r(t_M) - a_r \text{ MBP}$

11 The radial artery is approximately six inches below the brachial artery. This creates a
12 hydrostatic pressure head that can be accommodated by a further pressure head correction
13 factor of $p = \rho gh$, where

14 ρ = density of blood ($= 1.03 \text{ g/cm}^3$)

15 g = acceleration to gravity ($= 980 \text{ cm/sec}^2$)

16 $h = 6" \text{ } 15 \text{ cm}$

17 thus $p = 1.03 \text{ g/cm}^3 \text{ } 980 \text{ cm/sec}^2 \text{ } 15 \text{ cm} = 15141 \text{ g/cm sec}^2$

18 11 mm Hg if sitting (or 0 if supine)

19 and the calibrated radial pressure waveform $P_r(t)$ is derived from the Radial Signal $S_r(t)$
20 as follows:

21

22 $P_r(t) = (1/a_r)(S_r(t) - b_r) + p$

Please amend the specification paragraph starting on page 13 line 11 to add a small space between r and t in the equation to avoid confusion with π (pi) as follows:

11 Examples

12 $f_{\text{infl}}(t) = k \Rightarrow n_c(t) = n_o + kt$

13 (inflation)

14 ~~$f_{\text{defl}}(t) = kn_c \Rightarrow n_c(t) = n_o + (n_{\text{max}} - n_o)e^{-rt}$~~

14 $f_{\text{defl}}(t) = kn_c \Rightarrow n_c(t) = n_o + (n_{\text{max}} - n_o)e^{-rt}$

15 (deflation)

16 Constant r can be obtained for a particular oscillometric device as

17 $r = -\frac{1}{t_{.01}} \ln \frac{0.01n_o}{n_{\text{max}} - n_o}, t_{.01} \text{ x}$

18 time to 99% complete deflation.

PRELIMINARY AMENDMENT

Page 5

Filed: February 17, 2004

Docket No.: 120.020US2

Title: METHOD AND APPARATUS FOR CALIBRATING AND
MEASURING ARTERIAL COMPLIANCE AND STROKE VOLUME

Please amend the specification paragraph starting on page 15 line 1 as follows:

- 1 Using this signal, identify the peaks and nadirs of the individual pulses using a preferred
- 2 algorithm (e.g., as in the '433 '313 patent).

Please amend the specification paragraph starting on page 21 line 16 as follows:

16 We obtain stroke volume as

17

18 *Equation (15):* $SV = \int \text{flow}(t)dt = \int A(t)v(t)dt \approx \sum_{n=1,N} t_n A[n]v[n]$

19

20 where $A(t)$ is ascending aortic cross-sectional area as a function of time, $v(t)$ is ascending
21 aortic blood velocity as a function of time, $A[n]$ and $v[n]$ are the corresponding sampled
22 data values, t is the sampling interval, and N is the number of data points in a single
23 cardiac cycle. Here the integral is approximated with a simple sum, but any appropriate
24 numerical integration could be used to obtain higher precision (e.g. a high-order Newton-
25 Cotes). $A[n]$ and $v[n]$ are obtained as

26

27 *Equation (16):* $\dot{A}[n] = h_A[n-i]P_2[i]$

28 *Equation (17):* $\dot{v}[n] = h_v[n-i]P_2[i]$

PRELIMINARY AMENDMENT

Page 7

Filed: February 17, 2004

Docket No.: 120.020US2

Title: METHOD AND APPARATUS FOR CALIBRATING AND MEASURING ARTERIAL COMPLIANCE AND STROKE VOLUME

Please amend the specification paragraph starting on page 25 line 6 as follows:

6 In some embodiments, the first method further includes (f) using an oscillometric
7 signal to calibrate tonometric pressure signals in a contralateral arterial site.

8 In some embodiments, a calibrated radial pressure waveform $P_r(t)$ is derived from the
9 tonometric signal $S_r(t)$ as follows:

$$10 \quad P_r(t) = (1/a_r)(S_r(t) - b_r) + p$$

11 where $a_r = (S_r(t_D) - S_r(t_M)) / (DBP - MBP)$,

$$12 \quad b_r = S_r(t_M) - a_r \text{ MBP , and}$$

13 $p = \rho$ gh are calibration factors, and where

14 ρ = density of blood,

15 g = acceleration to gravity,

16 h = height difference between the oscillometric and the tonometric measurement sites,
17 and is zero if the patient is supine,

18 MBP is oscillometric mean arterial blood pressure measured at time t_M , and DBP is
19 oscillometric diastolic blood pressure measured at time t_D .

PRELIMINARY AMENDMENT

Filed: February 17, 2004

Page 8

Docket No.: 120.020US2

Title: METHOD AND APPARATUS FOR CALIBRATING AND MEASURING ARTERIAL COMPLIANCE AND STROKE VOLUME

Please amend the specification paragraph starting on page 27 line 5 as follows:

5 In some embodiments, the computer derives a calibrated radial pressure

6 waveform $P_r(t)$ from the tonometric signal $S_r(t)$ as follows:

$$7 \quad P_r(t) = (1/a_r)(S_r(t) - b_r) + p$$

8 where $a_r = (S_r(t_D) - S_r(t_M)) / (DBP - MBP)$,

$$9 \quad b_r = S_r(t_M) - a_r \quad \text{MBP, and}$$

10 $p = \rho g h$ are calibration factors, and where

11 ρ = density of blood,

12 $g =$ acceleration to gravity,

13 $h =$ height difference between the oscillometric and the tonometric
14 measurement sites, and is zero if the patient is supine,

15 MBP is oscillometric mean arterial blood pressure measured at time t_M , &

16 DBP is oscillometric diastolic blood pressure measured at time t_D .

17 In some embodiments, the computer system further calculates a first compliance value

18 based on the calibrated radial pressure waveform, estimates end-effects of the

19 oscillometric signal, and corrects the first compliance value using the estimated end

20 effects.